RESEARCH HIGHLIGHTS

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RESEARCH PROJECT ON THE NOISE PRODUCED BY DWV PIPES MADE OF CAST IRON, PVC AND ABS

Introduction

MJM Acoustical Consultants Inc. of Montréal was retained by the Cast Iron Soil Pipe Association to measure the noise produced by several 7.62 cm (3 in.) diameter DWV (drain, waste and vent) pipes made of cast iron, PVC (flexible plastic) and ABS (rigid plastic). The purpose was to study the type of noise emitted by DWV pipes during a 6-litre (1.6 gallon) toilet flush in a typical single-family dwelling or multi-unit building.

Eight series of acoustical measurements were conducted: four were with cast iron soil pipes, three with PVC and one with ABS. Acoustical measurements were conducted in an experimental setting in a Domtar Acoustical Laboratory.

Methodology

The experimental set-up for the study was typical of a DWV pipe installation found in most residential dwellings (single family or multi-unit): a toilet discharging into a 7.62 cm (3 in.) horizontal waste pipe connected to a 7.62 cm (3 in.) vertical waste stack and enclosed in a wall made of 1.27 cm (0.5 in.) gypsum board.

All pipes were installed, by a certified union plumber, in an identical physical configuration. They were tested under the same acoustical conditions, strictly following the same procedure to allow for direct comparison of the sound pressure results.

Background noise in the 90 m^3 reverberation chamber in which the pipes were installed was monitored to ensure it was always 10 dB below the noise radiated by unenclosed pipes for frequencies above 125 Hz. In the case of enclosed pipes, the noise radiated by the pipes, especially at high frequencies, was not always 10 dB higher than the background noise.

For each pipe tested, the noise measured was exclusively emitted by the pipe being tested. Monitoring confirmed there was no extraneous noise altering the results. Tests were repeated for each type of pipe being tested.

Results

An increase or decrease of 3 dB or less is generally considered marginal. An increase of 10 decibels gives the subjective impression that a sound has doubled, and decreasing the sound pressure level by 10 decibels gives an impression that the sound has been reduced by half.

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There was little variation in the noise levels radiated by different types of PVC pipes, as the variation did not exceed 3 dBA. The same minimal variation occurred in vertical cast iron pipes, but differences of up to 7 dBA were noted for horizontal cast iron pipes.

Tests performed on partially enclosed assemblies highlighted significant differences in the radiation pattern of horizontal drain and vertical stacks. With cast iron pipe assemblies, the vertical pipes radiated more noise than the horizontal ones during flushing of a toilet. In the case of PVC and ABS pipes, the opposite behaviour was noted: horizontal pipes produced significantly more noise than the vertical ones.

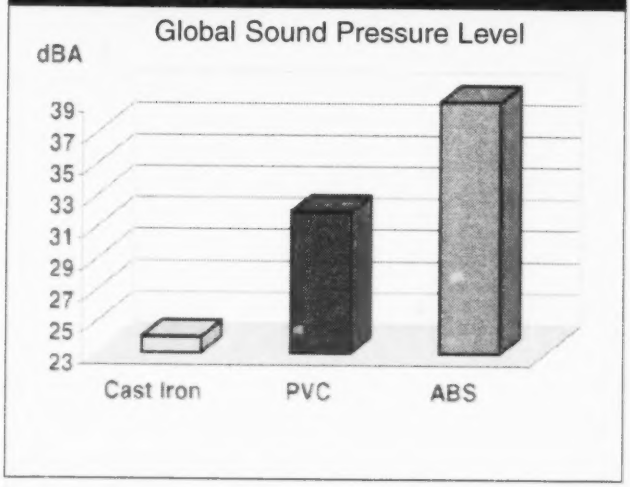
The extent of noise reduction provided by a drywall enclosure (15 dBA to 17 dBA) does not seem to be dependent on the pipe assembly tested.

The outcome of the testing is shown in the two figures below. The first one provides a summary of the noise levels emitted by each pipe. Results are given for the four configurations for which the tests were conducted. The second figure graphically illustrates the results.

Figure 1. Sound pressure levels

	Global sound pressure level (dBA, ref 20 microPa)			
Type of pipe	Bare pipes	Enclosed pipes	Vertical pipe unenclosed	Horizontal pipe unenclosed
XH (extra heavy) — ASTM A74	40	24	39	32
No-Hub long — CISPI 301, CSA B70	42	25	41	36
No-Hub short — CISPI 301, CSA B70	41	24	40	36
SV (service) — ASTM A74	43	26	41	39
System 15 (solid wall)	49	32	42	48
PVC 7300 — ASTM D2665 (solid wall)	48	33	43	47
PVC 4300 — ASTM F891 (cellular core)	51	34	45	48
ABS 3300 — ASTM F628 (cellular core)	55	39	49	54
Average cast iron	41	25	40	36
Average PVC	49	33	43	48

Figure 2. Comparison of sound pressure levels for cast iron, PVC and ABS



Conclusions

The study clearly established that DWV pipes made of cast iron are quieter than PVC and ABS pipes. There is a difference of 6 to 10 dBA between cast iron and PVC, with an average difference of 8 dB, and as much as 15 dBA between cast iron and ABS.

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Research Report: *Research Project on the Noise Produced by DWV Pipes Made of Cast Iron, PVC and ABS*, 2000

Research Consultants: MJM Acoustical Consultants Inc.

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